

# Staphaurex test-negative bovine *Staphylococcus aureus* mastitis strains and their impact on clinical mastitis

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## Key words

Staphaurex test-negative bovine *Staphylococcus aureus*, mastitis, clinical impact

## Aim of the study

Testing Staphaurex test-negative and Staphaurex test-positive *S. aureus* strains isolated from bovine mastitis in an udder cell model for their i) adhesion and invasion capacity and ii) corresponding cellular immune response induced.

## Material and methods

A strain collection of bovine *S. aureus* strains with documented anamnestic data (single cow problem, herd level problem, acute mastitis, mastitis, subclinical mastitis, chronic mastitis) was further characterized by a DNA microarray, by resistance typing, by genotyping according to Fournier et al. (2008), by *spa* typing and by the Staphaurex test. For selected representatives of the Staphaurex test-negative and Staphaurex test-positive group adhesion and invasion experiments as well as their corresponding cellular immune response induced on a bovine udder cell infection model were evaluated.

## Results and significance

In the Staphaurex test, 49% of the tested isolates were positive and 51% negative. All test-negative strains were assigned to CC151, whereas test-positive strains were assigned to various clonal complexes (CC97, CC8, CC479, CC20, CC7, CC9, CC45). Microarray profiles of test-negative isolates were highly similar, but differed largely from those of test-positive isolates. While the test-negative group lacked several enterotoxin genes and *sak*, it exhibited significantly higher prevalence rates of genes encoding enterotoxin C, toxic shock syndrome toxin, and leukocidins (*lukM/lukF-P83*, *lukD*). The findings suggest Staphaurex test-negative isolates to represent a group of closely related strains with specific resistance and virulence gene patterns.

Representatives of the Staphaurex test-positive and test-negative groups were then tested for their corresponding cellular immune response induced on bovine udder cells. Results for mRNA expression of the following factors are available: Interleukin (IL)- 8, IL-1, Tumor Nekrose Faktor-alpha (TNF), RANTES, serum amyloid, lactoferrin, GM-CSF, COX-2 and toll like receptor-2. The results clearly show, that the immune response of the representatives of the Staphaurex test-positive group is much higher compared to the immune response of representatives of the test-negative group.

It seems likely that the difference in the immune reaction against these two *S. aureus* groups may also reflect a difference in the clinical outcome of the mastitis. This, however, needs to be clarified in vivo in further studies.

## Publications, posters and presentations

Zbinden, C., Stephan, R., Johler, S., Bruckmaier, R.M. Wellnitz O. The inflammatory response of primary bovine mammary epithelial cells to *Staphylococcus aureus* strains with different molecular background. PLoS One, in preparation.

Moser, A., Stephan, R., Zbinden, C., Wellnitz, Corti, S., Bruckmaier, R.M., Johler, S. Comparison of genomic and antimicrobial resistance features of Staphaurex latex agglutination test-positive and Staphaurex latex agglutination test-negative *Staphylococcus aureus* causing bovine mastitis. Vortrag anlässlich des 14. Fachsymposiums Lebensmittelmikrobiologie 22. –24. April 2013, Tutzing.

Zbinden, C. et al. The inflammatory response of primary bovine mammary epithelial cells to *Staphylococcus aureus* strains reflect the molecular background of the bacteria. Poster anlässlich des jährlichen American Dairy Science Association Joint Meeting 8.-12. Juli 2013, Indianapolis, Indiana, US.

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